

Appl. No. 10/783,495
Amdt. dated 07/01/2009
Response to Office action of 05/01/2009

Attorney Docket No.: N1085-00251
[TSMC2003-0834]

REMARKS/ARGUMENTS

Claims 1-2 and 3-22 were previously pending in this application and each was rejected in the subject Office action.

Applicants take this opportunity to thank Examiner Norton for also addressing
5 Applicants' previously filed arguments in the *Response to Arguments* section of the subject Office action.

No claims are amended in this response.

Applicants respectfully request re-examination, reconsideration and allowance of each of pending claims 1 and 3-22.

10 I. **Claim Rejections based on the Park and Lensing references - 35 U.S.C. § 103**

In paragraph 7 of the subject Office action, claims 1, 3, 4 and 9-11 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Park, U.S. Patent No. 6,825,912 in view of U.S. Patent No. 6,630,362 to Lensing, hereinafter "Lensing".

15 In paragraph 14 of the subject Office action, claims 5-8 and 12-22 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Park in view of Lensing in further view of U.S. Patent No. 6,798,529 to Saka, et al. (hereinafter "Saka").

Applicants respectfully submit that each of these claim rejections is overcome for reasons set forth below.

20 Briefly and in summary, each of independent claims 1 and 12 is believed distinguished from Park in view of Lensing and each of the obviousness rejections under Section 103(a) should be withdrawn because:

- 25
- A) The stated (and only) objective of the Park reference is to change exposure TIME. This reinforces the only plausible interpretation of Park. The Park reference therefore cannot be used to support an obviousness rejection for changing exposure energy.

Appl. No. 10/783,495
Amdt. dated 07/01/2009
Response to Office action of 05/01/2009

Attorney Docket No.: N1085-00251
[TSMC2003-0834]

- 5
- B] With respect to the Examiner's excerpt from MPEP § 2123 that "Disclosed examples and preferred embodiments do not constitute a teaching away from a broader disclosure or non-preferred embodiments", Applicants point out that the Park reference is not a broader reference nor does it simply provide a non-preferred embodiment of solving a problem but, rather, the claimed invention lies completely outside of the scope of the Park teaching. The claimed invention is not contemplated by Park.
 - 10 • C] Even if one did attempt to combine the Park and Lensing references, the claimed invention would not result because neither reference nor any combination thereof, teaches the claimed feature of using a signal based on thickness of a subjacent layer, when patterning a different layer, namely a top layer.

Now addressing the rejections in more detail, claim 1 is an independent claim among the claims rejected in this section and provides for a feed forward signal based on the thickness of one layer, to control the exposure *energy* of a different layer. Independent claim 1 recites:

controlling the exposure energy with a feed forward process control signal of a compensation amount that compensates for thickness variations in a subjacent layer beneath a top layer, by combining the feed forward process control signal with the feedback process control signal to control the exposure energy used in patterning the top layer.

Independent claim 12 also provides for a feed forward signal based on thickness of one layer to control the exposure *energy* of a different layer:

a feed forward controller providing a feed forward control signal to an exposure apparatus based on a thickness measurement of an interlayer of the first patterned wafer substrate for controlling the exposure energy focused on a top layer of the first patterned wafer substrate, and . . .

In each of claim 1 and 12, the top layer is clearly distinguished from the subjacent layer: a subjacent layer beneath a top layer (claim 1); and an interlayer . . . and a top layer (claim 12). The layers are different, i.e. not the same layer. Claim 1 clearly recites that it is the thickness variations in one layer, i.e., the subjacent layer, that is used for controlling the exposure energy used in patterning another layer, i.e., the

Appl. No. 10/783,495
Amdt. dated 07/01/2009
Response to Office action of 05/01/2009

Attorney Docket No.: N1085-00251
[TSMC2003-0834]

top layer. Claim 12 clearly recites that it is the thickness measurement of one layer, i.e., the interlayer, that is used for controlling the exposure energy used in patterning a different layer, i.e., the top layer.

Applicants respectfully submit that Park does not teach the claimed feature of using a thickness variation or thickness of a first layer to control the exposure energy used in patterning a *different* layer. In referring to claim 1, the Examiner provides: *a subjacent layer beneath a top layer (Col. 3, lines 21-24 and Col. 5, lines 13-18; i.e. a silicon-nitride film of a reflection barrier layer)*. As a first matter, column 7, lines 1-2 of Park provide: *First an effective relation is accumulated of the profiles of the silicon-nitride film that acts as a reflection barrier layer*. As such, the silicon-nitride film IS a reflection barrier layer. They are one and the same. The silicon-nitride film is not a portion of a composite structure of reflection barrier layers. As such, in reference to the above-reproduced section of the Office action, Applicants are unsure as to whether the Examiner is alleging the silicon-nitride film to be the subjacent layer or the top layer. If it is to be considered the top layer, there is no subjacent layer from which thickness or thickness variation readings are garnered. If it is the subjacent layer, there is no layer above the silicon-nitride film that is patterned as in claims 1 and 12.

Park is limited to using the thickness measurement of the same layer being patterned. Col. 4, ll. 35-37 of Park provide:

20 In this invention, a reflectivity is determined by the thickness and quality of substrate surface formed in the most recent pre-exposure step process.

Col. 4, ll. 59-64 continue:

25 During processing, a wafer is first provided to a pre-exposure step process. In the pre-exposure step process 10, a silicon-nitride film is preferably deposited uniformly on the surface of a wafer. Next, the wafer is provided to a photo-exposure process 20. In the photo-exposure process 20, a photoresist is formed over a whole surface of the wafer

30

Appl. No. 10/783,495
Amdt. dated 07/01/2009
Response to Office action of 05/01/2009

Attorney Docket No.: N1085-00251
[TSMC2003-0834]

FIG. 1 clearly shows that there are no interceding steps between pre-exposure process step 10 and photo-exposure process step 20. Moreover, at no point does Park teach using the SiN thickness in a feed forward signal to the photo-exposure unit to control the photo-exposure process of another film, or vice versa. As such, Park is limited to using a thickness or reflectivity measurement of a film to provide a feed forward signal used in patterning that same film, not another film formed over the measured film as in claim 1 or claim 12. Claims 1 and 12 are therefore distinguished from Park for at least this reason.

Moreover, as indicated above, independent claim 1 recites the feature of "controlling the exposure energy" and independent claim 12 recites the feature of "for controlling the exposure energy". The Examiner also concedes that Park does not teach these features. In particular, the Examiner acknowledges on page 5 of the subject Office action that "*Park does not expressly teach to exposure energy (per definition of exposure energy on pg. 1, par [0002] of Applicant's Specification).*"

The Office action then alleges that Lensing teaches to controlling the exposure energy in semiconductor manufacturing and that "it would have been obvious to a person of ordinary skill in the art . . . to modify the teaching of Park to include controlling the exposure energy."

Applicants respectfully disagree and point out that the Park reference is titled SYSTEM FOR ADJUSTING A PHOTO-EXPOSURE TIME. The entire Park disclosure is directed to adjusting exposure time. The word "energy" does not appear in the Park patent. Lensing is apparently relied upon for proposing an increased energy exposure as an alternative to a longer duration exposure, but one of ordinary skill would not modify the Park teaching based on this suggestion in Lensing because there is no suggestion in Park to do so, and doing so would preclude the Park invention from carrying out its intended purpose of fine tuning exposure time.

Appl. No. 10/783,495
 Amdt. dated 07/01/2009
 Response to Office action of 05/01/2009

Attorney Docket No.: N1085-00251
 [TSMC2003-0834]

Park is directed to adjusting exposure time and only exposure time. The claims in Park are not directed to changing any other parameter of the exposure process and the claims are not broadly directed to improving the quality of a photolithography process, but rather, the claims, e.g., claim 1, are directed to: a system for adjusting a photo-exposure time in a semiconductor manufacturing apparatus. The purpose of Park is to change exposure time and apparently, nothing else. The title of Park is *System for Adjusting a Photo-Exposure Time*. The entire disclosure is directed to changing the photo-exposure time. One of ordinary skill in the art and in possession of a reference so directed and titled "System for Adjusting a Photo-Exposure Time", would not modify the reference to adjust something other than a photo exposure time, i.e., one would not modify such a reference to adjust exposure energy.

As such, there is NO teaching, suggestion or inference in Park to combine it with a reference that would result in something that would preclude Park from achieving its stated objective.

To combine references (A) and (B) properly to reach the conclusion that the subject matter of a patent would have been obvious, case law requires that there must be some teaching, suggestion, or inference in either reference (A) or (B), or both, or knowledge generally available that would lead one skilled in the art to combine the relevant teachings of references (A) and (B). Consideration must be given to teachings in the references that would have led one skilled in the art away from the claimed invention. A claim cannot properly be used as a blueprint for extracting individual teachings from references. *Ashland Oil, Inc. v. Delta Resins & Refractories, Inc.*, 776 F.2D 281, 227 U.S.P.Q. 657 (Fed. Cir. 1985).

There is no such suggestion in Park nor can an inference be made from reading Park, for combining Park's teachings with those of Lensing to produce the claimed invention as proposed by the Examiner. Park therefore fails to support the obviousness rejection based on the combination of Park and Lensing.

Moreover, prior art may be considered not to teach an invention and thereby may fail to support an obviousness rejection, particularly when the stated objectives of the prior art reinforce such an interpretation of the reference (see *WMS Gaming Inc. v.*

Appl. No. 10/783,495
Amdt. dated 07/01/2009
Response to Office action of 05/01/2009

Attorney Docket No.: N1085-00251
[TSMC2003-0834]

5 *International Game Technology: WMS Gaming Inc. v. International Game Tech.*, 184 F.3d 1339, 51 USPQ2d 1385 (Fed. Cir. 1999)). Applicants submit that it is uncontroverted that the stated objective of Park is to change exposure time and the Examiner concedes, as above, that this is distinguished from changing exposure energy.

10 As stated in MPEP § 2143.01, the modification proposed by the Examiner cannot render the prior art unsatisfactory for its intended purpose. In particular "if proposed modification would render the prior art invention being modified unsatisfactory for its intended purpose, then there is no suggestion or motivation to make the proposed modification. In re *Gordon*, 733 F.2d 900, 221 USPQ 1125 (Fed. Cir. 1984)". "When the Examiner proposes a combination that makes a prior art reference inoperable for its intended purpose, the resulting inoperable prior art reference may be considered to teach away from the proposed combination, i.e., not to teach the combination, thereby supporting a showing of non-obviousness" (emphasis added), In re *Gordon* at 902, 15 1127.

There is nothing to support an obviousness rejection based on combining Park and Lensing because one would not combine these references.

20 Even if one did attempt to combine the teachings of Park and Lensing, Lensing still does not make up for the above-stated deficiencies of Park which have been described above. Lensing does not teach the feature of using a thickness or thickness variation measurement of a subjacent layer to produce a feed-forward signal to control the exposure energy in a patterning operation used to form a pattern in a different, top layer, disposed over the subjacent layer. As such, even if did one combine Park and Lensing, claims 1 and 12 are still rendered distinguished from Park in view of Lensing.

25 Claims 3-11 each depend from claim 1 and are similarly distinguished from the combination of Park and Lensing. Claims 13-22 each depend from claim 12 and are

Appl. No. 10/783,495
Amdt. dated 07/01/2009
Response to Office action of 05/01/2009

Attorney Docket No.: N1085-00251
[TSMC2003-0834]

similarly distinguished from the combination of Park and Lensing. The rejection of claims 1, 3, 4 and 9-11 under 35 U.S.C. § 103(a), should be withdrawn.

I. Claim Rejections based on the Park, Lensing and Saka references – 35 U.S.C. § 103

5 As above, claims 5-8 and 12-22 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Park in view of Lensing in further view of U.S. Patent No. 6,798,529 to Saka, et al. (hereinafter "Saka").

10 Claims 5-8 depend from claim 1, which is distinguished from Park and Lensing, as above. Claim 12 is an independent claim with claims 13-22 depending from claim 12. Claim 12 is also distinguished from Park and Lensing as above.

15 Saka has apparently been relied upon for an interlayer thickness measurement after chemical mechanical planarization. This does not make up for the above-stated deficiencies of Park in view of Lensing. Saka is not directed to controlling exposure energy. Saka, in fact, is not even directed to controlling the exposure process in any manner. Saka is directed to detecting endpoint in chemical mechanical polishing (CMP). In Saka, the control signals based on thickness measurements are only used to control the CMP apparatus and Saka monitors the thickness and reflectance of the layer being polished, i.e., removed, not a subjacent layer or another layer different than the one being processed, as in the claimed invention.

20 Because Saka does not make up for the above-stated deficiencies of Park in view of Lensing, independent claims 1 and 12 and therefore also dependent claims 5-8 and 13-22, are distinguished from Park in view of Lensing and Saka.

The rejection of claims 5-8 and 13-22 under 35 U.S.C. § 103(a) as being unpatentable over Park in view of Lensing and Saka, should be withdrawn.

Appl. No. 10/783,495
Amdt. dated 07/01/2009
Response to Office action of 05/01/2009

Attorney Docket No.: N1085-00251

[TSMC2003-0834]

RECEIVED
CENTRAL FAX CENTER

JUL 01 2009

CONCLUSION

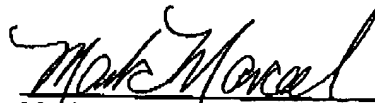
Based on the foregoing, each of pending claims 1 and 3-22 is in allowable form and the application in condition for allowance, which action is respectfully and expeditiously requested.

- 5 The Assistant Commissioner for Patents is hereby authorized to charge any fees necessary to give effect to this filing and to credit any excess payment that may be associated with this communication, to Deposit Account 04-1679.

Respectfully submitted,

10

Dated: July 1, 2009



Mark J. Marcelli, Reg. No. 36,593
Attorney for Applicant

15

20 DUANE MORRIS LLP
101 West Broadway, Suite 900
San Diego, CA 92101
Telephone: (619) 744-2200.
Facsimile: (619) 744-2201